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Mother Knows Best

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saltbush. Renin is an enzyme released by the kidneys to help control the body's sodium-potassium balance, fluid volume, and blood pressure. Eating diets high in salt lowers renin activity to increase excretion of salt from the body. Researchers concluded that grazing pregnant ewes on saltbush alters the renin activity of their lambs, which allows them to more efficiently gain weight when grazing saltbush as adults (Chadwick et al., 2009).

Young animals also learn about the flavors of foods mother prefers as they suckle because many dietary flavors are transferred through the milk. The flavors of plants, like onion and garlic, are transferred to offspring in the milk. Familiarizing lambs with forage flavors in the milk increases the likelihood that offspring will prefer these flavors when they forage later in life (Nolte and Provenza, 1992).

Learning What to Eat

Learning from mom is efficient. Young animals learn quickly about foods and they remember those foods for years. Lambs offered wheat with their mothers for an hour a day for 5 days ate more wheat than lambs offered wheat without their mothers. Even 3 years later, with no additional exposure to wheat, intake of wheat was nearly 10 times higher if lambs were exposed to wheat with their mothers than if they were exposed to wheat alone (Fig. 1) (Green et al., 1984). Lambs that grazed with their mothers prior to weaning also spend more time grazing than lambs inexperienced with grazing.

Mother knows best. For young herbivores paying attention to mother is crucial for learning where and where not to go and what foods to eat and to avoid. Through interactions with mother, young animals learn about their surroundings from the locations of water, shade, cover, and predators, to the kinds and locations of nutritious and toxic foods.

In Utero and Milk

Learning about foods begins before birth as young animals experience their mother's diet in the womb. In Australia, researchers studied if feeding saltbush to ewes from the 60th day of pregnancy until 3 weeks after birth would affect their lambs. At 10 months of age, lambs of mothers that grazed saltbush during pregnancy and shortly after birth, ate more saltbush, had heavier fleece weights, lower renin activity and gained more weight when grazing saltbush than lambs from mothers that didn't graze

Lastly in one study, lambs that grazed with their mothers learned more about grazing in 7 hours than lambs without their mothers learned about grazing in 26 hours (Ramos and Tennesen, 1992).

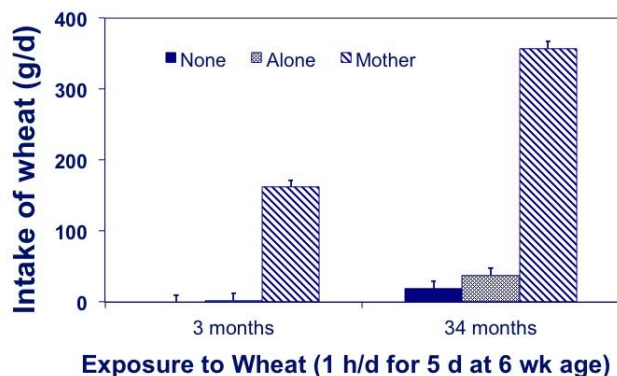
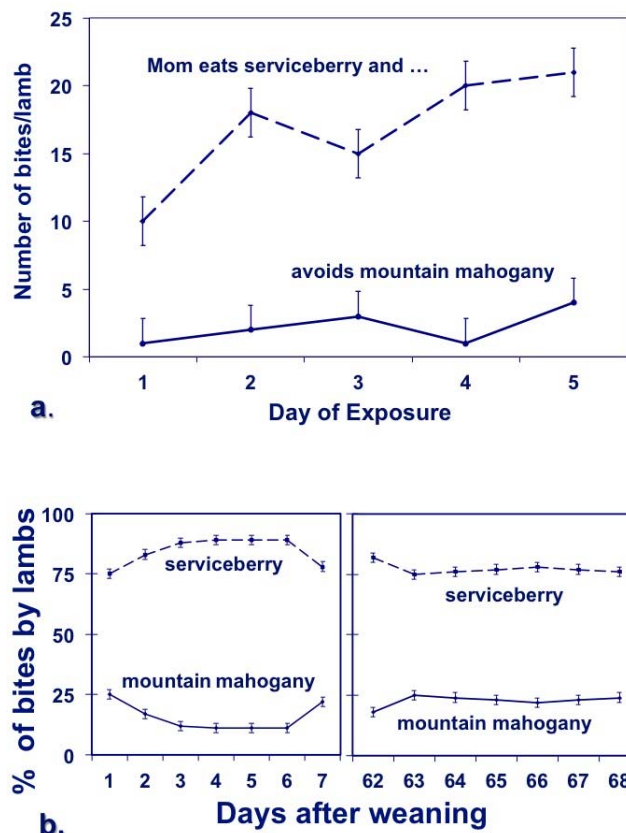


Figure 1. Intake of wheat by lambs exposed to wheat either alone, with their mother or with no exposure to wheat. Lambs were exposed to wheat for 1 hour/day at 6 weeks of age. One group of lambs was tested later at 3 months of age and a different group was tested at 34 months of age.

Eating with mom also increased acceptance of urea-molasses blocks by lambs and the likelihood lambs would eat blocks as adults. Use and intake of urea-molasses blocks by livestock is often variable. Lambs were exposed to urea-molasses block with mother from 3 to 14 weeks of age or they were not exposed to blocks. Forty weeks later, lambs, now yearlings, were offered molasses block for 3 weeks. For the group exposed to molasses blocks as lambs, 29 of 30 ate 62 pounds of block, while sheep inexperienced with blocks only ate 7 pounds of block and only 15 of 30 ate any of the molasses blocks during the trial (Lobato et al., 1980).

Exposing lambs with mother to weeds like leafy spurge increases intake of spurge. Lambs experienced eating leafy spurge took more bites of spurge and preferred leafy spurge when grazing a pasture with a high amount of spurge, but not in a pasture with a low amount of spurge. Lambs inexperienced with leafy spurge did not eat it regardless of spurge density. Compared to inexperienced lambs, experienced lambs had a higher daily forage intake on a pasture containing 50% spurge. They also had higher biting rate on leafy spurge and ate more spurge at later stages of maturity than inexperienced animals (Walker et al., 1992).

Offspring learn to eat nutritious foods and avoid toxic foods by eating nutritious foods with their mother and avoiding the foods their mother avoids. Lambs given a choice of the two shrubs, mountain mahogany and serviceberry, one of which their mother was trained to avoid, avoided the shrub their mother avoided (Fig. 2a). They continued to avoid the shrub mother avoided over two months after weaning (Fig. 2b). Through her actions, mother models beneficial foraging behaviors for her offspring (Mirza and Provenza 1990).



Figures 2a and b. Lambs ate the shrub their mothers ate and generally avoided the shrub their moms avoided. One group of ewes in the study was conditioned to eat mountain mahogany (MM) and avoid serviceberry (SB). The other group was conditioned to avoid MM and eat SB. The figure above is data from lambs whose mothers avoided MM and ate SB. Data was reversed for the other group of ewes and lambs (not shown).

Despite mother's influence, young animals don't eat foods that make them sick even if their mother readily eats the food. Lambs made sick each time they eat a food, even a food their mother strongly prefers, soon refuse to eat the food. Thus, mother models the behavior, but it's the consequences of eating the food that determines whether or not an animal will continue to eat it (Provenza et al., 1993).

Lambs learn about new foods more quickly when they eat with their mother than other ewes in the flock. Lambs exposed to barley with their mothers ate 40% more barley than lambs exposed to barley with an adult ewe from the flock. However, eating barley with any ewe dramatically improved intake of barley by lambs compared with lambs exposed to barley alone (Thorhallsdottir et al., 1990). In another study, lambs that grazed with their mothers spent more time grazing, increased their biting rate, and rumination time compared to lambs that grazed pasture with ewes that were not their mothers. Experience grazing with mom also changed food preferences and the time lambs spent grazing less palatable species (Phillips and Youssef, 1992).

Learning Where to Go

Both livestock and wildlife live in specific areas in the environment, called home ranges; animals tend to stay in these areas year after year. Interactions with mother influence locations of home ranges. In one study, Welsh Mountain sheep preferred native range while Clun sheep preferred seeded range. Lambs from Welsh Mountain sheep were grafted onto Clun sheep and vice versa. After weaning, the Clun lambs preferred native ranges, whereas the Welsh Mountain lambs preferred seeded ranges (Key and McIver, 1980).

The same has been shown for cattle on rangelands. Animals may stray from home ranges because of interactions with peers or lack of water or food in times of drought or fire. But they generally return to their home ranges when conditions improve. If drought dries up a water or forage supply, cattle must travel to find other sources of water and forage, thereby increasing the size of their home range. When conditions return to normal, cows are likely to return to their original home ranges. Peers can also affect home range use. In one study, heifers from different summer home ranges spent the winter together. The following summer, the size of their home ranges increased as heifers with different backgrounds interacted. As they matured, each group eventually returned to the home range they used as calves with their mothers (Howery et al., 1998).

On the Zimmerman Ranch in Nevada replacement heifers are not weaned along with the steers. Heifers are left with their mothers so they can learn

from their mothers how to survive on the desert. They must learn where to go when it storms and when there is a shortage of water or forage. They need to know how to use a country that is long on feed but short on water and to eat snow so they will not have to travel long distances to water. A heifer must learn these things so she will know how to care for herself and her calf. Her mother weans her at the proper time. Zimmerman says, "If we did wean her by keeping her in the fields to put on weight and then sent her back to the desert the following winter as a bred heifer, we would be signing her death warrant (Zimmerman, 1980)."

Wild herbivores also learn habitat preferences from their mothers. In some cases, home range fidelity is so strong that animals actually use poorer quality habitats as a result of experiences with mother. For instance, each fall a herd of moose in central Norway migrates to high-elevation winter ranges even though this is the reverse of normal patterns of migration to the lowlands near the sea. Archeological evidence indicates this has been occurring for the past 5,000 years. The moose evidently began this migration pattern because of hunting pressure. This behavior continues despite lower-than-normal calf production of the herd due to poor winter ranges conditions, and it demonstrates the persistence of learned habits (Andersen, 1991).

Conclusions

The fact that animals learn quickly and effectively from mother creates both problems and opportunities for managers. When mother has "bad" habits such as preferring to graze and loaf in along streams, her offspring learns the same habits. On the other hand, learning also creates opportunities. Bad riparian habits can be changed through the use of routine riding and moving cattle to the uplands to graze. Once new behaviors are learned, they will be passed from mother to offspring. The same is true of dietary habits. Managers can get weanlings to eat supplements quickly by feeding them to young animals and their mothers just prior to weaning, provided mom eats the supplement. Using mom to influence habitat and dietary preferences of her offspring is a simple technique that is often quick, easy, inexpensive and can greatly benefit the productivity of livestock.

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